

Claims

1. Catalyst that comprises:

- At least one hydro-dehydrogenating element that is selected from the group that is formed by elements of group VIB and of group VIII of the periodic table,
- a non-zeolitic silica-alumina-based substrate that contains an amount that is more than 10% by weight and less than or equal to 80% by weight of silica (SiO_2),
- a total pore volume, measured by mercury porosimetry, encompassed between 20 and 140 Å,
- a total pore volume, measured by mercury porosimetry, encompassed between 0.1 ml/g and 0.6 ml/g,
- a total pore volume, measured by nitrogen porosimetry, encompassed between 0.1 ml/g and 0.6 ml/g,
- a BET specific surface area encompassed between 150 and 500 m^2/g ,
- a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 140 Å, of less than 0.1 ml/g,
- a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 160 Å, of less than 0.1 ml/g,
- a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 200 Å, of less than 0.1 ml/g,
- a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 500 Å, of less than 0.1 ml/g,

- a pore distribution such that the ratio between volume V2, measured by mercury porosimetry, encompassed between $D_{mean} - 30 \text{ \AA}$ and $D_{mean} + 30 \text{ \AA}$ to the total mercury volume is more than 0.6 - volume V3, measured by mercury porosimetry, encompassed in the pores with diameters of more than $D_{mean} + 30 \text{ \AA}$ is less than 0.1 ml/g - volume V6, measured by mercury porosimetry, encompassed in the pores with diameters of more than $D_{mean} + 15 \text{ \AA}$ is less than 0.2 ml/g,
- an X diffraction diagram that contains at least the main lines that are characteristic of at least one of the transition aluminas encompassed in the group that consists of the alpha, rho, chi, eta, gamma, kappa, theta and delta aluminas.

Catalyst according to claim 1, in which the proportion of octahedral Al_{V1} determined by the analysis of the NMR MAS spectra of the solid of ²⁷Al is more than 50%.

3. Catalyst according to claims 1 to 2 that is based on nickel and tungsten.
4. Catalyst according to claims 1 to 2 that is based on platinum and palladium.
5. Catalyst according to one of the preceding claims that comprises at least one dopant that is selected from the group that is formed by phosphorus, boron, and silicon and is deposited on the catalyst.
6. Catalyst according to one of the preceding claims that comprises at least one element of group VIIIB.
7. Catalyst according to one of the preceding claims that comprises at least one element of group VB.
8. Catalyst according to one of the preceding claims such that the packing density is more than 0.85 g/cm³.

9. Non-zeolitic silica-alumina-based substrate that contains an amount that is more than 10% by weight and less than or equal to 80% by weight of silica (SiO_2), characterized by:
- a mean pore diameter, measured by mercury porosimetry, encompassed between 20 and 140 Å,
 - a total pore volume, measured by mercury porosimetry, encompassed between 0.1 ml/g and 0.6 ml/g,
 - a total pore volume, measured by nitrogen porosimetry, encompassed between 0.1 ml/g and 0.6 ml/g,
 - a BET specific surface area encompassed between 150 and 500 m^2/g ,
 - a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 140 Å, of less than 0.1 ml/g,
 - a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 160 Å, of less than 0.1 ml/g,
 - a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 200 Å, of less than 0.1 ml/g,
 - a pore volume, measured by mercury porosimetry, encompassed in the pores with diameters of more than 500 Å, of less than 0.01 ml/g,
 - a pore distribution such that the ratio between volume V2, measured by mercury porosimetry, encompassed between $D_{\text{mean}} - 30 \text{ \AA}$ and $D_{\text{mean}} + 30 \text{ \AA}$ to the total mercury volume is more than 0.6 - volume V3, measured by mercury porosimetry, encompassed in the pores with diameters of more than $D_{\text{mean}} + 30 \text{ \AA}$ is less than 0.1 ml/g - volume V6, measured by mercury porosimetry, encompassed in the pores with diameters of more than $D_{\text{mean}} + 15 \text{ \AA}$ is less than 0.2 ml/g,

- an X diffraction diagram that contains at least the main lines that are characteristic of at least one of the transition aluminas encompassed in the group that consists of the alpha, rho, chi, eta, gamma, kappa, theta and delta aluminas.
10. Substrate according to claim 9, in which the cationic impurity content is less than 0.1% by weight.
11. Substrate according to one of claims 9 and 10, in which the anionic impurity content is less than 0.5% by weight.
12. Substrate according to one of claims 9 to 11, such that the X diffraction diagram contains at least the main lines that are characteristic of at least one of the transition aluminas encompassed in the group that consists of eta, theta, delta and gamma aluminas.
13. Substrate according to one of claims 9 to 12, such that the X diffraction diagram contains at least the main lines that are characteristic of at least one of the transition aluminas contained in the group that consists of eta- and gamma-aluminas.
14. Substrate according to one of claims 9 to 13, such that the mean pore diameter is encompassed between 40 and 120 Å.
15. Substrate according to one of claims 9 to 14 such that it comprises at least two silico-aluminum zones that have Si/Al ratios that are less than or greater than the overall Si/Al ratio that is determined by X fluorescence.
16. Substrate according to one of claims 9 to 15 such that it comprises a single silico-aluminum zone that has an Si/Al ratio that is equal to the overall Si/Al ratio that is determined by X fluorescence and is less than 2.3.

17. Substrate according to one of claims 9 to 16, such that the packing density, after calcination, is more than 0.65 g/cm³.
18. Substrate according to one of claims 9 to 17 whose acidity that is measured by IR tracking of the thermodesorption of the pyridine is such that the B/L ratio is encompassed between 0.05 and 1.
19. Process for hydrocracking and/or hydroconversion of hydrocarbon-containing feedstocks that use the catalyst according to one of claims 1 to 8 or the catalyst that contains the substrate according to one of claims 9 to 18.
20. Process for hydrocracking and/or hydroconversion according to claim 19 that is carried out according to the so-called single-stage process.
21. Process for hydrocracking and/or hydroconversion according to claim 20 that comprises:
 - A first hydrorefining reaction zone in which the feedstock is brought into contact with at least one hydrorefining catalyst that exhibits in the standard activity test a methylcyclohexane conversion level that is less than 10% by mass,
 - A second hydrocracking reaction zone in which at least a portion of the effluent that is obtained from the hydrorefining stage is brought into contact with at least one non-zeolitic hydrocracking catalyst that exhibits in the standard activity test a methylcyclohexane conversion level that is more than 10% by mass,
 - and in which the proportion of the catalytic volume of the hydrorefining catalyst represents 20 to 45% of the total catalytic volume.

22. Process for hydrocracking and/or hydroconversion according to claim 19 that comprises at least a first hydrorefining reaction zone and at least a second reaction zone that comprises a hydrocracking of at least a portion of the effluent of the first zone and that comprises an incomplete separation of ammonia from the effluent that exits from the first zone.
23. Process for hydrocracking and/or hydroconversion according to claim 19 in the so-called two-stage process.
24. Process according to one of claims 19 to 23 that operates, in the presence of hydrogen, at a temperature of more than 200°C, under a pressure of more than 1 MPa, whereby the volumetric flow rate is encompassed between 0.1 and 20 h⁻¹, and the amount of hydrogen that is introduced is such that the volumetric ratio of liter of hydrogen/liter of hydrocarbon is encompassed between 80 and 5000 l/l.
25. Process for hydrocracking and/or hydroconversion according to one of claims 19 to 24 that operates at a pressure encompassed between 20 and 60 bar and that results in conversions of less than 40%.
26. Process according to one of claims 19 to 25 that operates in a fixed bed.
27. Process according to one of claims 19 to 25 that operates in a boiling bed.
28. Process according to claim 23, in which the catalyst is based on at least one of the noble elements of group VIII.
29. Process according to claim 28, in which the catalyst is based on platinum and/or palladium.
30. Process for hydrotreatment of hydrocarbon-containing feedstocks that use the catalyst according to one of claims 1 to 8 or the catalyst that contains the substrate according to one of claims 8 to 18.

31. Process according to claim 30 that is placed upstream from a hydrocracking process.
32. Process according to claim 31, where the hydrocracking catalyst is based on zeolite.
33. Process according to claim 31, where the hydrocracking catalyst is based on silica-alumina.
34. Process according to one of claims 19 to 33, in which the hydrocracking catalyst is based on nickel and tungsten.
35. Process according to one of claims 19 to 34, in which the hydrocarbon-containing feedstocks are selected from the group that is formed by LCO (light cycle oil), atmospheric distillates, vacuum distillates, whereby the feedstocks are obtained from units for extracting aromatic compounds from lubricating oil bases or obtained from solvent dewaxing of lubricating oil bases, whereby the distillates are obtained by processes for desulfurization or hydroconversion in a fixed bed or in a boiling bed of RAT (atmospheric residues) and/or RSV (vacuum residues) and/or desasphalted oils, the deasphalted oils, by themselves or in a mixture.